

D-21266

IN THE CLAIMS

1. (Currently amended) An asymmetric Group 8 (VIII) metallocene of the general formula  $\text{CpMCp}'$ ,

where

M is a metal selected from the group consisting of Ru, and Os ~~and Fe~~;

Cp is a first substituted cyclopentadienyl or indenyl moiety that includes at least one substituent group  $\text{D}_1$ ;

Cp' is a second substituted cyclopentadienyl or indenyl moiety that includes at least one substituent group  $\text{D}_1'$ ;

wherein

$\text{D}_1$  is different from  $\text{D}_1'$ ;

$\text{D}_1$  is selected from the group consisting of:

$\text{X}$ ;

$\text{C}_{a1}\text{H}_{b1}\text{X}_{c1}$ ;

$\text{C}_{a2}\text{H}_{b2}\text{X}_{c2}(\text{C}=\text{O})\text{C}_{a1}\text{H}_{b1}\text{X}_{c1}$ ; and

$\text{C}_{a2}\text{H}_{b2}\text{X}_{c2}\text{OC}_{a1}\text{H}_{b1}\text{X}_{c1}$ ,

where

X is F, Cl, Br, I or  $\text{NO}_2$ ;

$a_1$  is an integer from 2 to 8;

$b_1$  is an integer from 0 to  $2(a_1)+1-c_1$ ;

$c_1$  is an integer from 0 to  $2(a_1)+1-b_1$ ;

$b_1 + c_1$  is at least 1;

$a_2$  is an integer from 0 to 8;

$b_2$  is an integer from 0 to  $2(a_2) + 1 - c_2$ ;

$c_2$  is an integer from 0 to  $2(a_2) + 1 - b_2$ ; and

~~$\text{D}_1'$~~   $\text{D}_1'$  is selected from the group consisting of:

D-21266

X;

 $C_{a1}H_{b1}X_{c1}$ ; $C_{a2}H_{b2}X_{c2}(C=O)C_{a1}H_{b1}X_{c1}$ ; and $C_{a2}H_{b2}X_{c2}OC_{a1}H_{b1}X_{c1}$ ,

where,

X is F, Cl, Br or I or  $NO_2$ ;

a1 is an integer from 1 to 8;

b1 is an integer from 0 to  $2(a1)+1 - c1$ ;c1 is an integer from 0 to  $2(a1)+1 - b1$ ;

b1 + c1 is equal to or greater than 1;

a2 is an integer from 0 to 8;

b2 is an integer from 0 to  $2(a2)+1 - c2$ ;c2 is an integer from 0 to  $2(a2)+1 - b2$ ; and

b2 + c2 is equal to or greater than 1.

2. (Original) The asymmetric metallocene of Claim 1 wherein either or both of Cp and Cp' includes at least one additional substituent,  $D_x$ , selected from the group consisting of:

X;

 $C_{a1}H_{b1}X_{c1}$ ; $C_{a2}H_{b2}X_{c2}(C=O)C_{a1}H_{b1}X_{c1}$ ; $C_{a2}H_{b2}X_{c2}OC_{a1}H_{b1}X_{c1}$ ; $C_{a2}H_{b2}X_{c2}(C=O)OC_{a1}H_{b1}X_{c1}$ ; and $C_{a2}H_{b2}X_{c2}O(C=O)C_{a1}H_{b1}X_{c1}$ ,

where,

X is F, Cl, Br or I or  $NO_2$ ;

a1 is an integer from 0 to 8;

b1 is an integer from 0 to  $2(a1)+1 - c1$ ;

D-21266

$c_1$  is an integer from 0 to  $2(a_1)+1 - b_1$ ;

$b_1 + c_1$  is equal to or greater than 1;

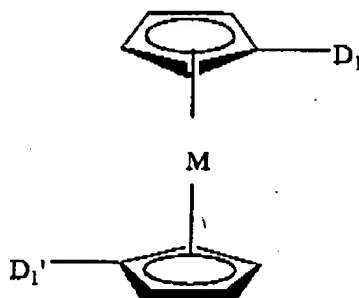
$a_2$  is an integer from 0 to 8;

$b_2$  is an integer from 0 to  $2(a_2)+1 - c_2$ ;

$c_2$  is an integer from 0 to  $2(a_2)+1 - b_2$ ; and

$b_2 + c_2$  is greater to or equal to 1.

3. (Currently amended) A metallocene compound represented by the following molecular formula:



where

M is selected from the group consisting of Ru, and Os and Fe;

$D_1$  is different from  $D_1'$  and  $D_1$  and  $D_1$  and  $D_1'$  are independently selected from the group consisting of:

X;

$C_{a1}H_{b1}X_{c1}$ ;

$C_{a2}H_{b2}X_{c2}(C=O)C_{a1}H_{b1}X_{c1}$ ; and

$C_{a2}H_{b2}X_{c2}OC_{a1}H_{b1}X_{c1}$ ,

where

X is F, Cl, Br, I or  $NO_2$ ;

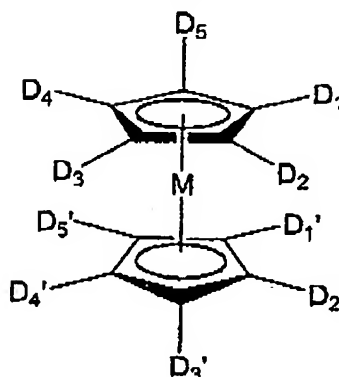
D-21266

a1 is an integer from 1 to 8;  
b1 is an integer from 0 to  $2(a1)+1-c1$   
c1 is an integer from 0 to  $2(a1)+1-b1$ ;  
b1 + c1 is at least 1;  
a2 is an integer from 0 to 8;  
b2 is an integer from 0 to  $2(a2)+1-c2$ ; and  
c2 is an integer from 0 to  $2(a2)+1-b2$ .

4. (Original) The metallocene compound of Claim 3, wherein  $D_1$  is methyl and  $D_1'$  is selected from the group consisting of ethyl, propyl, isopropyl, n-butyl, sec-butyl and tert-butyl.
5. (Original) The metallocene compound of Claim 3, wherein  $D_1$  is ethyl and  $D_1'$  is selected from the group consisting of propyl, isopropyl, n-butyl, sec-butyl and tert-butyl.
6. (Original) The metallocene compound of Claim 3, wherein  $D_1$  is propyl and  $D_1'$  is selected from the group consisting of isopropyl, n-butyl, sec-butyl and tert-butyl.
7. (Original) The metallocene compound of Claim 3, wherein  $D_1$  is isopropyl and  $D_1'$  is selected from the group consisting of n-butyl, sec-butyl and tert-butyl.
8. (Original) The metallocene compound of Claim 3, wherein  $D_1$  is n-butyl and  $D_1'$  is selected from the group consisting of sec-butyl and tert-butyl.
9. (Original) The metallocene compound of Claim 3, wherein  $D_1$  is sec-butyl and  $D_1'$  is tert-butyl.

D-21266

10. (Currently amended) A compound of the general formula,



where

M is selected from the group consisting of Ru, Os and Fe;

D<sub>1</sub>, D<sub>1</sub>' and D<sub>2</sub> are different and each is independently selected from the group consisting of:

X;

C<sub>a1</sub>H<sub>b1</sub>X<sub>c1</sub>;

C<sub>a2</sub>H<sub>b2</sub>X<sub>c2</sub>(C=O)C<sub>a1</sub>H<sub>b1</sub>X<sub>c1</sub>; and

C<sub>a2</sub>H<sub>b2</sub>X<sub>c2</sub>OC<sub>a1</sub>H<sub>b1</sub>X<sub>c1</sub>.

where

X is F, Cl, Br I or NO<sub>2</sub>;

a<sub>1</sub> is an integer from 1 to 8;

b<sub>1</sub> is an integer from 0 to 2(a<sub>1</sub>)+1 - c<sub>1</sub>

c<sub>1</sub> is an integer from 0 to 2(a<sub>1</sub>)+1 - b<sub>1</sub>;

b<sub>1</sub> + c<sub>1</sub> is at least 1;

a<sub>2</sub> is an integer from 0 to 8;

b<sub>2</sub> is an integer from 0 to 2(a<sub>2</sub>) + 1 - c<sub>2</sub>;

c<sub>2</sub> is an integer from 0 to 2(a<sub>2</sub>) + 1 - b<sub>2</sub>; and

each of D<sub>3</sub>, D<sub>4</sub>, D<sub>5</sub>, D<sub>2</sub>', D<sub>3</sub>', D<sub>4</sub>', and D<sub>5</sub>' is independently selected from

D-21266

the group consisting of:

$X$ ;

$C_{a1}H_{b1}X_{c1}$ ;

$C_{a2}H_{b2}X_{c2}(C=O)C_{a1}H_{b1}X_{c1}$ ;

$C_{a2}H_{b2}X_{c2}OC_{a1}H_{b1}X_{c1}$ ;

$C_{a2}H_{b2}X_{c2}(C=O)OC_{a1}H_{b1}X_{c1}$ ; and

$C_{a2}H_{b2}X_{c2}O(C=O)C_{a1}H_{b1}X_{c1}$ ,

where,

$X$  is F, Cl, Br, I or  $NO_2$ ;

$a1$  is an integer from 0 to 8;

$b1$  is an integer from 0 to  $2(a1)+1 - c1$ ;

$c1$  is an integer from 0 to  $2(a1)+1 - b1$ ;

$b1 + c1$  is equal to or greater than 1;

$a2$  is an integer from 0 to 8;

$b2$  is an integer from 0 to  $2(a2)+1 - c2$ ;

$c2$  is an integer from 0 to  $2(a2)+1 - b2$ ;

$b2 + c2$  is equal to or greater than 1.

11. (New) An asymmetric Group 8 (VIII) metallocene of the general formula  $CpMCp'$ ,

where

$M$  is a metal selected from the group consisting of Ru, Os and Fe;

$Cp$  is a first substituted cyclopentadienyl or indenyl moiety that includes at least one substituent group  $D_1$ ;

$Cp'$  is a second substituted cyclopentadienyl or indenyl moiety that includes at least one substituent group  $D_1'$ ;

wherein

D-21266

$D_1$  is different from  $D_1'$ ;

$D_1$  and  $D_1'$  are independently selected from the group consisting of:

X;

$C_{a1}H_{b1}$ ; and

$C_{a2}H_{b2}(C=O)C_{a1}H_{b1}$ ;

where

X is F, Cl, Br or I;

a1 is an integer from 1 to 4;

b1 is an integer  $2(a1)+1$ ;

a2 is an integer from 0 to 2; and

b2 is an integer  $2(a2)$ .

12. (New) The asymmetric metallocene of Claim 11 wherein either or both of Cp and Cp' includes at least one additional substituent,  $D_x$ , selected from the group consisting of:

X;

$C_{a1}H_{b1}$ ; and

$C_{a2}H_{b2}(C=O)C_{a1}H_{b1}$ ;

where

X is F, Cl, Br or I;

a1 is an integer from 0 to 4;

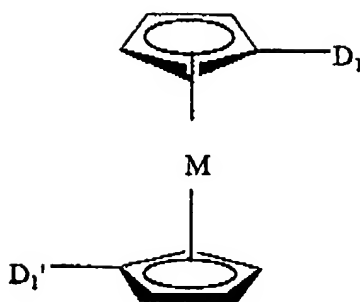
b1 is an integer  $2(a1)+1$ ;

a2 is an integer from 0 to 2; and

b2 is an integer  $2(a2)$ .

13. (New) A metallocene compound represented by the following molecular formula:

D-21266



where

M is selected from the group consisting of Ru, Os and Fe;

D<sub>1</sub> and D<sub>1</sub>' are different and are independently selected from the group consisting of:

X;

C<sub>a1</sub>H<sub>b1</sub>; and

C<sub>a2</sub>H<sub>b2</sub>(C=O)C<sub>a1</sub>H<sub>b1</sub>;

where

X is F, Cl, Br or I;

a<sub>1</sub> is an integer from 1 to 4;

b<sub>1</sub> is an integer 2(a<sub>1</sub>)+1;

a<sub>2</sub> is an integer from 0 to 2; and

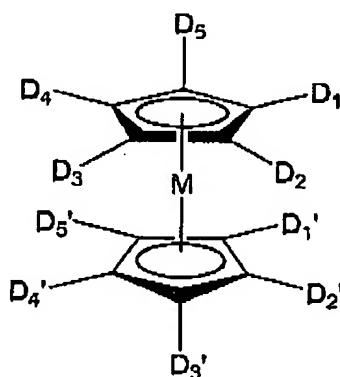
b<sub>2</sub> is an integer 2(a<sub>2</sub>).

14. (New) The metallocene compound of Claim 13, wherein D<sub>1</sub> is methyl and D<sub>1</sub>' is selected from the group consisting of ethyl, propyl, isopropyl, n-butyl, sec-butyl and tert-butyl.



D-21266

15. (New) The metallocene compound of Claim 13, wherein  $D_1$  is ethyl and  $D_1'$  is selected from the group consisting of propyl, isopropyl, n-butyl, sec-butyl and tert-butyl.
16. (New) The metallocene compound of Claim 13, wherein  $D_1$  is propyl and  $D_1'$  is selected from the group consisting of isopropyl, n-butyl, sec-butyl and tert-butyl.
17. (New) The metallocene compound of Claim 13, wherein  $D_1$  is isopropyl and  $D_1'$  is selected from the group consisting of n-butyl, sec-butyl and tert-butyl.
18. (New) The metallocene compound of Claim 13, wherein  $D_1$  is n-butyl and  $D_1'$  is selected from the group consisting of sec-butyl and tert-butyl.
19. (New) The metallocene compound of Claim 13, wherein  $D_1$  is sec-butyl and  $D_1'$  is tert-butyl.
20. (New) A compound of the general formula,



where

$M$  is selected from the group consisting of Ru, Os and Fe;

$D_1$ ,  $D_2$  and  $D_1'$  are different and are independently selected from the

D-21266

group consisting of:

X;

$C_{a1}H_{b1}$ ; and

$C_{a2}H_{b2}(C=O)C_{a1}H_{b1}$ ;

where

X is F, Cl, Br or I;

a1 is an integer from 1 to 4;

b1 is an integer  $2(a1)+1$ ;

a2 is an integer from 0 to 2; and

b2 is an integer  $2(a2)$ ; and

each of  $D_2$ ,  $D_3$ ,  $D_4$ ,  $D_5$ ,  $D_2'$ ,  $D_3'$ ,  $D_4'$ , and  $D_5'$  is independently selected from the group consisting of:

X;

$C_{a1}H_{b1}$ ; and

$C_{a2}H_{b2}(C=O)C_{a1}H_{b1}$ ;

where

X is F, Cl, Br or I;

a1 is an integer from 0 to 4;

b1 is an integer  $2(a1)+1$ ;

a2 is an integer from 0 to 2; and

b2 is an integer  $2(a2)$ .

21. (New) The metallocene compound of Claim 14 which comprises 1-ethyl-1'-methylruthenocene.